REMARKS

Claims 1-23 will be pending upon entry of the present amendment. Claim 20 is amended. Claims 21-23 are new. No new matter is being presented.

The applicants respectfully request reconsideration of the finality of the office action. The finality is premature because the office action includes new grounds of rejection of claims 18-19. As recognized by the Examiner, the previous office action dated May 16, 2006 did not include a rejection of claims 18-19. The present office action dated February 23, 2007 rejects claim 18 under 35 U.S.C. § 102 and rejects claim 19 under 35 U.S.C. § 103. While the Examiner believes that such new grounds of rejection presents no addition burden to the applicants, the applicants have had no previous opportunity to respond to the rejections based on the particular combination of elements presented in claims 18-19, which depend on claim 10. Accordingly, the applicants request withdrawal of the finality of the office action and entry of the present amendment.

One embodiment of the invention is a motion estimation method that is shown in Figure 5 of the present application. In step 502, a primary global motion vector *gmv* is computed by averaging the motion vectors of a current row of a picture. In step 503, the primary global motion vector *gmv* is perturbed to obtain initial values of secondary global motion vectors *gmv1*, *gmv2*. In steps 504 to 510, the motion vectors of the row are classified into first and second groups and the second global motion vectors *gmv1, gmv2* are determined. In particular, in step 505 each motion vector of the row is compared to the secondary global motion vectors. If the motion vector is closer to the first global motion vector *gmv1*, than the motion vector is assigned to the first group in step 507. Similarly, if the motion vector is closer to the secondary global motion vector *gmv2*, than the motion vector is assigned to the second group in step 508. In steps 509-510, the secondary global motion vectors *gmv1*, *gmv2* are recalculated based on the motion vectors assigned to the first and second groups, respectively.

Claims 1-2, 4-5, 7-8, 10, 16 and 18 were rejected under 35 U.S.C. § 102(b) as being anticipated by UK Patent Application 2 208 774 to Morgan et al. ("Morgan").

Morgan does not disclose the invention recited in claim 1. Claim 1 recites a motion estimation method that includes:

determining a primary global motion vector for the selected group from all of the corresponding block motion vectors;

classifying the block motion vectors from the selected group into a plurality of sub-groups;

determining a plurality of secondary global motion vectors corresponding to the respective sub-groups from the block motion vectors classified in the respective sub-groups.

selecting the primary and/or at least one of the secondary global motion vectors for use in defining one or more search windows for each block in the selected group to enable block matching with a reference picture.

Morgan does not disclose determining a plurality of secondary global motion vectors corresponding to the respective sub-groups from the block motion vectors classified in the respective sub-groups. Morgan simply discloses selecting the eight most common local motion vectors and labeling them as global motion vectors based on frequency of occurrence and other criteria (Morgan page 16, line 3-5). Thus, the only "sub-groups" in Morgan are the group of global motion vectors ("global MV group") and the group of motion vectors that did not become global motion vectors ("non-global MV group"). Morgan never determines a secondary global motion vector from the motion vectors in the global MV group. Instead, Morgan simply outputs all of the global motion vectors in the global MV group to a motion vector selector 230 (p. 10, lines 16-26). In addition, Morgan certainly does not determine a secondary global motion vector, corresponding to non-global MV group, from the motion vectors in the non-global MV group. Instead, the motion vectors in the non-global MV group are only used by the motion vector selector 230 for those pixels in the blocks (and neighboring blocks) corresponding to the motion vectors in the non-global MV group (p. 10, lines 19-25).

The applicants disagree with the Examiner's assertion (page 9, first line of office action) that the global motion vectors of Morgan correspond to "certain sub-groups." Morgan does not mention or show any sub-groups other than the global MV group and non-global MV group mentioned above. Morgan simply labels the eight most frequent local motion vectors as global motion vectors without forming any "sub-groups that differ from the most common vector

by a certain amount." If the Examiner continues to assert that Morgan discloses the step of determining a plurality of secondary global motion vectors corresponding to the respective sub-groups, the applicants respectfully request the Examiner to identify the sub-groups disclosed in Morgan and which secondary global motion vectors correspond to those sub-groups.

For the foregoing reasons, claim 1 is not anticipated by Morgan.

Claims 2, 4-5, and 7 depend on claim 1, and thus are not anticipated by Morgan.

In addition, claim 7 recites additional features not disclosed by Morgan. Claim 7 recites "selecting and performing one of a plurality of motion estimation and search schemes based on selected characteristics of the primary and secondary global motion vectors, the plurality of motion estimation and search schemes employing various combinations of the global motion vectors and matching-block search window schemes." Morgan does not disclose plural motion estimation and search schemes or any selection between such schemes. Instead, Morgan discloses only a single motion estimation and search scheme in which a block matcher 190 calculates correlation surfaces representing spatial correlation between blocks of two input fields, a correlation surface processor 200 generates interpolated correlation surfaces, and a motion vector estimator 210 that detects points of greatest correlation in the interpolated correlation surfaces (p. 9, lines 4-12). Morgan is not specific as to how the block matcher 190, correlation surface processor 200, and motion estimator 210 perform searching to estimate the motion vectors, but nowhere suggests that the searching is varied in any way or that there is any selection between plural searching schemes.

The applicants disagree with the Examiner's assertion that page 10, line 10 to page 11, line 8 disclose the elements of claim 7. None of those sections disclose any selection between plural motion estimation and search schemes. The discussion on page 9 of the office action is entirely directed to the selection of preferred motion vectors from previously generated motion vectors that were generated according to Morgan's single search scheme discussed above. The discussion on page 10 of the office action is directed to the operation of the motion vector selector 230. The operation of the motion vector selector, as discussed on page 10, line 26 – page 11, line 8 and as its name implies, involves selecting motion vectors without performing any searching according to any scheme. The Examiner also has not pointed to how the motion

vector selector 230 or any other part of Morgan discloses plural search and estimation schemes "employing various combinations of the global motion vectors and matching-block search window schemes. The selection of previously generated motion vectors by the motion vector selector 230 simply does not involve plural matching-block search window schemes.

For the foregoing reasons, claim 7 is not anticipated by Morgan.

Morgan does not disclose the invention recited in claim 8. Claim 8 recites a motion estimation method that includes:

determining a plurality of global motion vectors for the selected group, each of the global motion vectors being formed from a plurality of the corresponding block motion vectors;

analyzing the global motion vectors and determining a metric representing a distribution pattern thereof;

selecting a motion estimator scheme on the basis of the distribution pattern metric, the motion estimator scheme being selected from amongst a plurality of motion estimator schemes each having different combination of search strategy and number of global motion vectors;

Morgan does not disclose the step of selecting a motion estimator scheme on the basis of the distribution pattern metric representing a distribution pattern of the global motion vectors. As discussed above with respect to claim 7, Morgan does not disclose any selecting between plural motion estimator schemes. In addition, Morgan does not suggest selecting between motion estimator schemes based on a metric representing a distribution pattern of global motion vectors. As recognized by the Examiner, Morgan selects global motion vectors from among motion vectors that pass a frequency test and a confidence test. Such tests for motion vectors cannot possibly be a metric representing a distribution pattern of global motion vectors, because it is logically circular and makes no sense to select global motion vectors based on a distribution pattern of global motion vectors.

For the foregoing reasons, claim 8 is not anticipated by Morgan.

Claim 16 depends on claim 8, and thus is not anticipated by Morgan.

Although the language of claim 10 is not identical to claims 1 or 8, the allowability of claim 10 will be apparent in view of the foregoing discussion.

Claim 18 depends on claim 10 and further recites that "the generating step includes classifying the block motion vectors from the selected group into a plurality of sub-groups; and determining a plurality of secondary global motion vectors corresponding to the respective sub-groups from the block motion vectors classified in the respective sub-groups; wherein the selecting step includes selecting the primary and/or at least one of the secondary global motion vectors for use in defining one or more search windows for each block in the selected group to enable block matching with a reference picture."

Morgan does not disclose "determining a plurality of secondary global motion vectors corresponding to the respective sub-groups from the block motion vectors classified in the respective sub-groups." As discussed in claim 1, Morgan does not disclose determining plural secondary global motion vectors corresponding to respective sub-groups. In addition, Morgan does not determine such secondary global motion vectors from the block motion vectors classified in the respective sub-groups. As discussed above with respect to claim 1, the only "sub-groups" in Morgan are the global MV and non-global MV groups, and Morgan does not determine any such secondary global motion vectors based on either of those groups. That is especially so with respect to the non-global MV group because it makes no sense to determine a global motion vector from a non-global MV group that only includes local motion vectors that were determined not to include global motion vectors.

For the foregoing reasons, claim 18 is not anticipated by Morgan.

Claim 20 was rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan.

Morgan does not teach or suggest the invention of claim 20, which depends on claim 1. First, Morgan does not teach or suggest the step from claim 1 of "determining a plurality of secondary global motion vectors corresponding to the respective sub-groups" substantially for the reasons expressed above with respect to claim 1.

Second, Morgan does not teach or suggest determining initial secondary global motion vectors based on the determined primary global motion vector. The Examiner points out

that Morgan keeps track of frequency counts that inherently have an initial value. Such initial frequency counts are not initial secondary global motion vectors and are certainly not based on a determined primary global motion vector. The Examiner asserts that Morgan determines a primary global motion vector as the motion vector with the highest frequency count after counting has completed, and if counting has completed, Morgan cannot determine initial secondary global motion vectors based on such a primary global motion vector.

Third, Morgan does not teach or suggest updating each secondary global motion vector based on the block motion vectors classified into the sub-group corresponding to the secondary global motion vector. Morgan never suggests updating any motion vectors based on any other motion vectors. Updating frequency counts does not update any secondary global motion vector.

For the foregoing reasons, claim 20 is nonobvious in view of Morgan.

Claim 3 was rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan in view of U.S. Patent No. 6,600,786 to Prakash et al. ("Prakash").

Morgan and Prakash do not teach or suggest the invention recited in claim 3, which depends on claim 1. First, Prakash does not teach or suggest any of the features of claim 1 that are missing from Morgan. Second, Prakash does not suggest computing global motion vectors as averages of other motion vectors. However, Prakash discloses determining a characteristic motion vector that can represent any number of types of segments; a single segment, a base segment, or the average for the entire group of segments (Prakash col. 11 lines 54-55). Such averaging of "segments" does not suggest generating primary and secondary motion vectors by averaging motion vectors of corresponding sub-groups.

For the foregoing reasons, claim 3 is nonobvious in view of the cited prior art.

The Examiner rejected claims 6, 9, 17, and 19 under 35 U.S.C. § 103(a) as being unpatentable over Morgan in view of U.S. Patent No. 5,428,396 to Yagasaki et al. ("Yagasaki"); claims 11-12 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Morgan in view of U.S. Patent No. 6,249,550 to Mizuno et al. ("Mizuno"); and claims 13 and 15 under 35 U.S.C. § 103(a) as being unpatentable over Morgan in view Yagasaki and Mizuno.

Morgan and Yagasaki do not teach or suggest the invention recited in claim 6, which depends on claim 1, and claims 9 and 16, which depend on claim 8. Yagasaki does not teach or suggest the features of claim 1 and 8 that are discussed above as missing from Morgan. Accordingly, claims 6, 9, and 17 are nonobvious in view of Morgan and Yagasaki.

Morgan and Mizuno do not teach or suggest the invention recited in claim 11. Claim 11 recites an encoder that includes:

> a global motion estimator …, each global motion vector being generated from a plurality of block motion vectors from a respective group of related blocks in the picture;
>
> a motion characteristics analyzer … to determine a metric representing a distribution pattern thereof;
>
> a selector coupled … for selecting a motion estimation scheme from amongst a plurality of motion estimation schemes …; and
>
> a plurality of motion estimators … for performing data block matching of at least one subsequent picture in the sequence using the selected motion estimation scheme ….

Morgan and Mizuno do not teach or suggest the global motion estimator, the selector, or the plurality of motion estimators. As discussed above with respect to claim 8, Morgan does not teach or suggest generating a global motion vector from plural block motion vectors of a group of related blocks in the picture. Similarly, Mizuno also does not generate any global motion vector from plural block motion vectors. The Examiner points to Figure 11 and col. 18, line 63 to col. 19, line 43 of Mizuno as showing two motion estimators, but that section of Mizuno discusses four minimum value detecting circuits 132-135 operating in parallel. Such parallel operation does not suggest a selection between plural motion estimation schemes or plural motion estimators for matching a subsequent picture using a selected motion estimation scheme.

Accordingly, claims 11-2 and 14 are nonobvious in view of the cited prior art.

Claims 13-15 depend on claim 11, and thus, are not taught or suggested by Morgan and Mizuno. In addition, Yakasaki does not teach or suggest the features of claim 11

that are missing from Morgan and Mizuno. Accordingly, claims 13-15 are nonobvious in view of the cited prior art.

New claims 21-23 depend on claim 1, and thus, are allowable for the reasons expressed above with respect to claim 1. In addition, each of claims 21-23 recites other features not taught or suggested by the cited prior art. Claim 21 recites that the classifying step includes, for each block motion vector of the selected group, comparing the block motion vector to the initial secondary global motion vectors and assigning the block motion vector to whichever one of the sub-groups corresponds to a closest secondary global motion vector of the plurality of secondary global motion vectors that is closest to the block motion vector. None of the cited references suggest comparing each block motion vector to initial secondary global motion vectors and assigning the block motion vector to the sub-group corresponding to the secondary global motion vector that is closest to the block motion vector. Claims 22 and 23 depend on claim 21 and recite further details of the determining and classifying steps that are not suggested by the cited prior art. Accordingly, new claims 21-23 are in condition for allowance.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

Respectfully submitted,

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